IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	Examiner:	**Hirl, Joseph P**
MacGregor BELNIAK and **Jorge MORALEDA**	)	Art Group:	**2129**
Application No. 10/074,958	)		
Filed: February 11, 2002	)		
For: **DATA MANIPULATION AND DECISION PROCESSING**	)		

Board of Patent Appeals and Interference
P.O. Box 1450
Alexandria, VA 22313-1450

CORRECTED APPEAL BRIEF

In response to the Notice of Non-Compliant Appeal Brief mailed by the Patent & Trademark Office on 11 May 2007, Appellants present the following Corrected Appeal Brief. Appellants were unable to discern any deficiency in several of the items to which objection was raised, and were unable to obtain clarification from the Examiner. It is believed that the current Corrected Appeal Brief is in full compliance with the requirements of 37 C.F.R. § 41.37.

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I. REAL PARTY IN INTEREST

MacGregor Belniak and Jorge Moraleda, the parties named in the caption, transferred their rights in that which is disclosed in the subject application to Data Digest Corporation through an assignment recorded on 17 May, 2002 (see reel/frame no. 012903/0853). Data Digest Corporation subsequently assigned these rights to Remington Partners, a California corporation, through an assignment recorded on 29 May 2002 (see reel/frame no. 012932/0911). Remington Partners further assigned the rights in the material disclosed to Decision Q on 2 August 2002. A *nunc pro tunc* assignment memorializing this transfer was recorded on 31 July 2006 at reel/frame no. 018035/0597.

Decision Q is the owner at the time this brief is filed, and therefore is the real party in interest.

II. RELATED APPEALS AND INTERFERENCES

Appellants are unaware of any related appeals or interferences that will directly affect, be directly affected by, or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

Claims 11-23 are pending in this application. All claims stand rejected. Claims 11-23 are presented for appeal based on arguments in support of independent claim 11 and dependent claims 12, 14, 15, 18-20 and 23.

IV. STATUS OF AMENDMENTS

All amendments have been entered.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The invention concerns methods for analyzing data in a database (p. 14, ll. 5-13), automatically finding models that correspond to the data (p. 15, ll. 4-13), and then using the models to make decisions for new test cases (p. 16, ll. 6-10). Experts can monitor and guide the modeling process (p. 15, l. 14 – p. 16, l. 5).

Independent claim 11 recites a method comprising: dynamically processing a database to eliminate missing values in records, each record to contain a plurality of values (p. 28, l. 11 – p. 29, l. 6), preparing a statistical summary of processed data in the database (p. 17, ll. 11-17), searching through possible relationship models to find a high-scoring network (p. 15, ll. 10-13; p. 38, ll. 2-8; p. 38, ll. 10-16), and using the high-scoring network to compute a decision for a new case (p. 16, ll. 6-10). *See also*, Figure 3, elements 1, 2, 3, 4, 5a, 5b, 5d, 6, 7a, 7b, 8, 9a, 9b, 9c, 9d and 10.

Claim 12 refines the method of claim 11, requiring the additional operation of discretizing continuous variables in the database before preparing the plurality of statistical summaries (p. 29, ll. 8-14).

Claim 13 refines the method of claim 11, requiring the additional operation of modifying a relationship of the high-scoring network (p. 38, l. 17 – p. 39, l. 13; p. 42, l. 8 – p. 43, l. 8).

Claim 14 refines the method of claim 11, limiting it to the situation where the new case consists of values of a subset of fields of a record (p. 16, ll. 6-10).

Claim 15 refines the method of claim 11, limiting it to the situation where records in the database represent bank customer transaction records, and the decision is to identify an at-risk customer of the bank (p. 16, l. 11 – p. 17, l. 9).

Claim 16 refines the method of claim 11, limiting it to the situation where the statistical summary is a Bayesian model of correlations between data in records (p. 20, l. 15 – p. 21, l. 4).

Claim 17 refines the method of claim 11, limiting it to the situation where the decision is one of a detection of an illegal financial transaction, a network fault diagnosis, or a prediction of a result of a pharmaceutical compound in an organism (p. 14, l. 14 – p. 15, l. 3; p. 22, ll. 2-3; p. 22, ll. 16-17; p. 22, l. 19).

Claim 18 refines the method of claim 11, requiring the additional operations of aggregating similar database records together and computing a frequency of occurrence (p. 27, ll. 9-18).

Claim 19 refines the method of claim 18, limiting it to the situation where aggregating comprises preparing a plurality of hashes to cluster the database records (p. 27, ll. 9-18).

Claim 20 refines the method of claim 11, limiting it to the situation where the database structure is an alternating decision tree ("ADTree") (p. 30, ll. 7-15; p. 35, ll. 4-6).

Claim 21 refines the method of claim 11, limiting it to the situation where the database structure comprises correlation statistics between nodes (p. 20, l. 15 – p. 21, l. 4).

Claim 22 refines the method of claim 11, requiring the additional operation of inferring a value of a non-observed variable based on a previous observation and the high-scoring network (p. 44, l. 2 – p. 45, l. 11).

Claim 23 refines the method of claim 11, requiring the additional operation of storing the high-scoring network in an eXtensible Markup Language ("XML") format (p. 47, ll. 12-14).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 11-23 are rejected under 35 U.S.C. § 102(b) as anticipated by *A Tutorial on Learning With Bayesian Networks* by Heckerman ("*Heckerman*"). Applicants present separate arguments in support of independent claim 11 and dependent claims 12, 14, 15, 18-20 and 23.

VII. ARGUMENT

Applicants will present a brief overview of the reference of record and explain generally why the reference fails to support the rejections of the pending claims. Detailed analyses of the rejections follow.

A Tutorial on Learning with Bayesian Networks **by Heckerman**

The Examiner rejects all claims under 35 U.S.C. § 102(b) as anticipated by a technical report authored by David Heckerman and published in 1995 (revised in 1996) by Microsoft Research ("*Heckerman*").

Heckerman, true to its title, is a tutorial-style introduction to Bayesian Networks and their use in machine learning. It begins with an overview of the mathematical bases underlying Bayesian analysis, considered in the context of a simple example with only a limited number of observations and possible outcomes. Subsequently, the concepts are extended to problems with larger numbers of variables.

Heckerman may be likened to a collection of user's manuals describing various tools in a toolbox. There is a great deal of information that is useful to those of skill in the relevant arts, but the manuals do not instruct the reader to build any particular thing.

Heckerman, inasmuch as it is a tutorial, *does* discuss certain specific applications in its examples. However, as Applicants will explain below, the examples are different from the claimed material, so the reference fails to teach or suggest the claimed elements, arranged as recited in the claims. Consequently, the rejected claims are allowable over this reference.

A. Rejection of Claim 11 under 35 U.S.C. § 102(b)

Independent claim 11 recites a method comprising several operations, including dynamically processing a database to eliminate missing values in records, each record to contain a plurality of values; preparing a statistical summary of processed data in the database; constructing a database structure to

hold the statistical summary; searching through possible relationship models to find a high-scoring network; and using the high-scoring network to compute a decision for a new case. These operations define a "soup to nuts" process by which an embodiment of the invention can produce a decision based on information in a database.

The Examiner rejects most elements of this claim as anticipated by two sections of *Heckerman*: Section 6, which discusses "Methods for Incomplete Data," and Section 12, "A Simple Example." The "Methods for Incomplete Data" section does describe several techniques for addressing missing values, but (as mentioned earlier) it is in the nature of an instruction manual for dealing with a particular situation. That situation does not exist in the "Simple Example" of Section 12. There, the imagined database is fully populated, so missing value handling is not implicated.

Furthermore, although claim 11 requires searching through possible relationship models to find a high-scoring network, the example considered in *Heckerman*'s Section 12 does not perform such searching. Instead, *Heckerman* selects two networks (the one shown in Fig. 3 on p. 13, and the same network with one added arc) and simply asserts that they are the only two that have appreciable probability (*see* p. 36:1-4). Another example discussed later in Section 12 uses a hand-constructed Bayesian network (*see* p. 36:16-18), not a high-scoring network found during a search through possible relationship models.

Finally, the Examiner asserts that the claimed operation of preparing a statistical summary of the processed data in the database is anticipated by *Heckerman*'s Abstract, if one assumes that the claimed "statistical summary" is synonymous with the Abstract's "probabilistic semantics." Applicants believe that there are very few passages in which the words "statistical summary" could be replaced by "probabilistic semantics," and *Heckerman*'s Abstract is certainly not one of them. *Heckerman* is describing characteristics of graphical models that

are Bayesian networks, and asserting that they have the useful property of being able to answer causal questions like "why did this happen?" as well as probabilistic questions like "what are the chances that this will happen again?" These properties may be present in Bayesian networks, and they may be useful, but it is not clear that they have anything to do with the claimed operation of preparing a statistical summary of processed data in the database.

Applicants have no quarrel with *Heckerman*'s descriptions of Bayesian networks, their strengths and weaknesses, or the accuracy of the mathematical derivations presented. However, most of *Heckerman* merely presents a menu of options and possibilities, leaving the selection and combination thereof to the implementer. In *Heckerman*'s examples that do outline a relatively complete set of choices, the choices are different from Applicants' claimed method. Thus, Applicants respectfully submit that *Heckerman* does not disclose each element of the rejected claim, arranged as stated in the claim. The Board should overturn the rejection of claim 11.

B. Rejection of Claim 12 under 35 U.S.C. § 102(b)

Claim 12 refines the method of claim 11, requiring that continuous variables in the database be discretized before preparing the statistical summaries. This is said to be anticipated by *Heckerman* at p. 9:11. However, that portion of the reference (generally) is presenting the background mathematics upon which Bayesian networks are founded, and the cited portion specifically notes that "the observed variable X is discrete, having r possible states..." (*see Heckerman*, p. 9, l. 11). In addition to being disconnected from any specific sequence of operations, the reference *already has* discrete data, so there is no need to discretize a continuous variable, as claim 12 recites. The Board should overturn the rejection of claim 12.

C. Rejection of Claim 14 under 35 U.S.C. § 102(b)

Claim 14 refines the method of claim 11, limiting it to circumstances where the new case for which a decision is to be computed consist of values of a subset of fields of a record. Although *Heckerman* does discuss missing values, unobserved values, and related subjects, the portion relied upon by the Examiner (p. 12, ll. 16-23) discusses challenges that may be encountered in building a Bayesian network and not producing a decision based for a new case with missing values. Applicants' review of other sections that concern missing values does not disclose a connection to any of *Heckerman*'s proposed sequences for computing a decision, so it is respectfully submitted that the rejection of claim 14 is inadequately supported. The Board should overturn the rejection of this claim.

D. Rejection of Claim 15 under 35 U.S.C. § 102(b)

Claim 15 recites a specific application of the method of claim 11, wherein the database records represent bank customer transaction records, and the decision is to identify an at-risk customer of the bank. The Examiner rejects this in view of a passage in *Heckerman* that discusses identifying fraudulent credit card transactions. Thus, although bank customer transaction records are arguably involved, the decision in each case is different. *Heckerman* purports to identify (possibly) fraudulent transactions, while the method of claim 15 identifies at-risk customers. A customer is different from a transaction, so the reference fails to teach or suggest every element of the claim. The Board should overturn the rejection of claim 15.

E. Rejection of Claim 18 under 35 U.S.C. § 102(b)

Claim 18 recites a refinement of the method of claim 11, comprising aggregating similar database records and computing a frequency of occurrence. This is rejected in view of a portion of *Heckerman* that contrasts the Bayesian approach with classical probabilistic analysis of a simple system: throwing a thumbtack up and determining the probability that it will land on its point or on

its head. It is the classical probabilistic analysis in which the results of several throws are combined to produce an estimate of the probability for a subsequent throw. Thus, the "aggregating" arguably disclosed in this portion of the reference is irrelevant to the Bayesian network approach discussed in the example relied upon to reject the base claim of claim 18. In addition to the deficiencies in the rejection of base claim 11, Applicants respectfully submit that the rejection of claim 18 rests on material that cannot be incorporated. The Board should overturn the rejection of claim 18.

F. Rejection of Claim 19 under 35 U.S.C. § 102(b)

Claim 19 refines the method of claim 18, requiring the use of hashes to cluster the database records. This claim is rejected in view of a brief discussion of variables whose values correspond to the possible true values of the physical probability. Hashes, on the other hand, are pseudo-random numbers that represent a sort of condensation or compression of data. Hashes are often irreversible, but are useful to compare two (possibly large) data objects: if the data objects have the same hash value, then they are (very likely to be) identical.

This property is useful in grouping (or clustering) database records, as recited in the claim, but it is not clear what *Heckerman*'s variables, discussed at p. 5:33 through p6:1, have in common with such hashes. Applicants respectfully request that the Board overturn the rejection of claim 19.

G. Rejection of Claim 20 under 35 U.S.C. § 102(b)

Claim 20 refines the method of claim 11, requiring that the database structure be an alternating decision tree ("ADTree"). The Examiner asserts that an ADTree is a binary tree, and that *Heckerman*'s binary variables achieve the same result. An ADTree may, indeed, be a binary tree, but the converse is not true: not all binary trees are ADTrees. Furthermore, the portion of *Heckerman* relied upon by the Examiner does not appear to address binary trees. For example, the Bayesian network depicted in *Heckerman*'s Figure 4 is not a binary

tree (note that "Sample 1," "Y" has three parent nodes). It is also unclear that the cited text has much to do with either binary trees or binary variables, though perhaps there is a deeper connection that seems implicit to the Examiner but is lost on Applicants. Applicants respectfully request that the Board carefully review the rejection of claim 20.

H. Rejection of Claim 23 under 35 U.S.C. § 102(b)

Claim 23 extends the method of claim 11, requiring the high-scoring network to be stored in an eXtensible Markup Language ("XML"). This claim is rejected in view of *Heckerman*'s mention of a system called BUGS that was developed by Thomas, Spiegelhalter, and Gilks. The Examiner asserts that "BUGS is available in hypertext markup language which for the purpose intended is not functionally distinct from extensible markup language." However, no support for this assertion is offered, and even assuming (arguendo) that the first part is true, it does not follow that HTML is not functionally distinct from XML. XML has many differences from HTML, as those of skill in the relevant arts will be aware, and may be thought of as a superset of HTML. It is significant that the claim recites XML: HTML would not offer adequate functionality for the purposes of an embodiment of the invention. The Board should overturn the rejection of this claim.

Conclusion

Based on the foregoing, Applicants request that the Board overturn the rejection of all pending claims and hold that all of the claims currently under review are allowable.

Respectfully submitted,
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VIII. CLAIMS APPENDIX

The claims involved in this appeal are presented below.

1.–10. (Canceled)

11. (Previously Presented) A method comprising:

dynamically processing a database to eliminate missing values in records, each record to contain a plurality of values;

preparing a statistical summary of processed data in the database;

constructing a database structure to hold the statistical summary;

searching through possible relationship models to find a high-scoring network; and

using the high-scoring network to compute a decision for a new case.

12. (Previously Presented) The method of claim 11, further comprising:

discretizing continuous variables in the database before preparing the plurality of statistical summaries.

13. (Previously Presented) The method of claim 11, further comprising:

modifying a relationship of the high-scoring network.

14. (Previously Presented) The method of claim 11 wherein the new case consists of values of a subset of fields of a record.

15. (Previously Presented) The method of claim 11 wherein records in the database represent bank customer transaction records, and the decision is to identify an at-risk customer of the bank.

16. (Previously Presented) The method of claim 11 wherein the statistical summary is a Bayesian model of correlations between data in records.

17. (Previously Presented) The method of claim 11 wherein the decision is one of a detection of an illegal financial transaction, a network fault diagnosis, or a prediction of a result of a pharmaceutical compound in an organism.

18. (Previously Presented) The method of claim 11, further comprising:
aggregating similar database records together; and
computing a frequency of occurrence.

19. (Previously Presented) The method of claim 18 wherein aggregating comprises:
preparing a plurality of hashes to cluster the database records.

20. (Previously Presented) The method of claim 11 wherein the database structure is an alternating decision tree ("ADTree").

21. (Previously Presented) The method of claim 11 wherein the database structure comprises correlation statistics between nodes.

22. (Previously Presented) The method of claim 11, further comprising:
inferring a value of a non-observed variable based on a previous observation and the high-scoring network.

23. (Previously Presented) The method of claim 11, further comprising:
storing the high-scoring network in an eXtensible Markup Language ("XML") format.

IX. EVIDENCE APPENDIX

None.

X. RELATED PROCEEDINGS APPENDIX

None.